DETAILED ACTION

Response to Amendment

1. In response to the amendment received March 27, 2008:

a. Claim 4 has been cancelled as per Applicant's request. Claims 1-3 and 5-14 are currently pending.

b. The objection to the specification has been withdrawn in light of the amendment.

c. Portions of the previous art of record are maintained, which changes being made as either (a) as necessitated by amendment or (b) with regards to the style of the new examiner.

Continued Examination Under 37 CFR 1.114

2. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on March 27, 2008 has been entered.

Claim Objections

3. Claim 9 objected to because of the following informalities: failing to include a definite article ('said' or 'the') in between the words "which" and "second" in line 7, as is needed for grammatical correctness. Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 1-3 and 5-14 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention. Claims 1 and 11 now recite that a rate [of fuel flow] is adjusted. However, the specification does not mention that the *rate* is adjusted. The specification does not provide reasonable support for this. The specification teaches that the *quantity* of fuel is changed using the pause to switch on ratio (see para 0030, for example). This, however, does not necessarily equate to the fact that rate is adjusted. If fuel is being delivered at the same rate during the time wherein the switch is disconnected, the quantity of fuel is still increased without the fuel flow rate being increase. For example, such excess fuel can be store in a storage reservoir (para 0021). Accordingly, the quantity is increasing without the flow rate being increased. Since claims 2-3, 5-10, and 12-14 are dependent on either claim 1 or claim 11, they are rejected for the same reason.

5. Claims 3, 5, 6, and 14 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

d. Claims 3, 5-6, and 13 recite the limitation "the quantity" in line 2 (line 3 for claim 13). There is insufficient antecedent basis for this limitation in the claim.

e. Claim 14 recites the limitation "the pause-to-switch-on ratio" in line 3. There is insufficient antecedent basis for this limitation in the claim.

Claim Interpretation

6. In light of the 112 issues brought to light due to the amendment, two interpretations will be applied to the claims. Interpretation 1 will be directed to the claims in such a manner that the new matter rejection is upheld, wherein the claims are read in light of the Specification (i.e. that the quantity is adjusted, not the rate). Interpretation 2 will be directed to claim language (i.e. that the flow rate is adjusted).

Interpretation 1:

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1, 3, 7-9, and 10-14 are rejected under 35 U.S.C. 102(b) as being anticipated by US 2002/0057066 A1 (Autenrieth et al.).

As to claims 1 and 11, Autenrieth et al. teaches a method of operating a fuel cell system that comprises switching the fuel cell on and off electrically depending on the available quantity of fuel (para 0005). By switching the fuel cell on and off via an electric switch the power output to the load is controlled and the fuel flow within or to the fuel cell is controlled (para 0014-0015). Furthermore, it is noted that the fuel cell unit [3] is electrically switched off (pause) if the load requirement for the fuel cell unit requires more fuel than is available and subsequently accumulates fuel until the fuel concentration is high enough so that the fuel cell can provide sufficient electric power, and thus is switched on again (switched on interval) (para 0021). Accordingly, this action is seen as reactive with respect to a generated feedback signal (as if no feedback signal was generated, it would not be known what the load requirement is, and then the actions as listed above would not occur). The aforementioned position with respect to feedback signals is supported by para 0016, which teaches of manipulating the switch [10] (pause vs. switch-on) with respect to voltage applied to the switch, which is triggered via voltage pulse with regards to the availability of burnable gas. In reaction to this control method, Autenrieth et al. teach that fuel is flowed in such a manner that a sufficient quantity must be reached before the switch [10] to close and operate the fuel (which adjusts the quantity accumulated via the flow of the fuel) (thus adjusting the actual pause/switch-on to the preset target value of pause/switch-on ratio, wherein the preset target value corresponds to the "sufficient burnable gas available" criterion). It is noted that the process (of switching) is repeated periodically (repeatedly), wherein the

amount of fuel consumed by the fuel cell would affect power output (as applied to claim 11) (para 0031; para 0033).

With respect to claim 3, Autenrieth et al. teach the use of a hydrogen gas generating unit (reformer) to supply fuel (hydrogen) to the anode side of the fuel cell (para 0011; para 0029).

With respect to claim 10, Autenrieth et al. teach that their method of operating a fuel cell can be applied to a fuel cell vehicle (para 0027-0028).

As to claim 12, Autenrieth et al.'s method inherently has a closed loop, negative feedback based process wherein the actual value of the open/close ratio and the target value of the open/close ratio conform.

Where applicant claims a composition in terms of a function, property or characteristic and the composition of the prior art is the same as that of the claim but the function is not explicitly disclosed by the reference, the examiner may make a rejection under both 35 U.S.C. 102 and 103, expressed as a 102/103 rejection.

The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic. In re Rijckaert, 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993).

"In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the allegedly inherent characteristic necessarily flows from the teachings of the applied prior art." Ex parte Levy, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990)

In the case of the instant application the basis for expectation of inherency is that method of operating system of Autenrieth et al. is the same the same as that claimed by the instant application. Furthermore, Examiner draws from the specific teachings of Autenrieth et al. As set forth in the rejection to claims 1 and 11, the feedback received (considered "negative feedback" barring specification as to what "negative" pertains to) activates the voltage trigger loop (closed loop) (para 0016). Accordingly, the target open/close ratio (pause to switch-on ratio) corresponds to when sufficient gas exists, whereas the actual ratio corresponds to whether or not sufficient gas exists (as determined by the feedback and loop) (para 0016). Since the actual target value acts according to that of the target value (of being open once sufficient gas availability), it conforms to that of the target value.

As to claims 7 and 13, Autenrieth et al.'s method inherently has the new quantity of supplied fuel determined from a product of a previous quantity of supplied fuel and a correction factor, wherein the correction factor includes at least the target value and the actual values of the pause to switch-on (synonymous to open/close, as listed in claim 12) ratio. The basis for inherency is that the insufficient amount of fuel left (previous quantity) when the switch [10] is opened is still present. Furthermore, fuel is fed until the sufficient amount of fuel is met (thus encompassing both the target and actual values of the pause to switch-on ratio and the claimed correction factor). Therefore, the new quantity of fuel supplied (before the switch is reconnected) is based on the factors listed above.

As to claims 8 and 14, Autenrieth et al.'s method of operating inherently has a correction factor, wherein the correction factor is the sum of one plus the difference between the preset target value and a current actual value of the pause-to-switch-on ratio. The basis for inherency is that the method of operating is the same between the prior art. Since an old quantity, a target value, and an actual value are encompassed (since fuel is fed until the sufficient amount of fuel is met), it would behave in the same manner (i.e. according to the relationship).

Furthermore, it is noted that the relationship is listed in the instant application $Q_{new} = Q_{old} * F_D * (1 + ((P/E)_{desired} – (P/E)_{actual})$ (para 0034). This relationship supports the position of inherency, as states that this relationship is what exists. With respect to Autenrieth et al., the method operates in such a manner that that a desired ratio and an actual ratio exist (wherein the desired ratio corresponds to having sufficient burnable gas available and the actual ratio corresponds to when there is too little burnable gas available). Therefore, since all of the factors exist, Autenrieth et al.'s fuel cell system and method of operating would behave following the same relationship.

(For an alternate interpretation, please see * within the 103 rejections.)

As to claims 9, Autenrieth et al.'s method of operating inherently has a damping factor between 0.1 and 1, wherein in the case of a first actual value of the pause-to-switch-on ratio, the factor is smaller than in the case of a second actual value of the pause to switch-on ratio, which the second actual value is larger than the first actual value. The basis for inherency is that the method of operating is the same between the prior art. Since an old quantity, a target value, and an actual value are encompassed

(since fuel is fed until the sufficient amount of fuel is met), it would behave in the same manner (i.e. according to the relationship).

Furthermore, it is noted that the relationship is listed in the instant application $Q_{new} = Q_{old} * F_D * (1 + ((P/E)_{desired} – (P/E)_{actual})$ (para 0034). This relationship supports the position of inherency, as states that this relationship is what exists. With respect to Autenrieth et al., the method operates in such a manner that that a desired ratio and an actual ratio exist (wherein the desired ratio corresponds to having sufficient burnable gas available and the actual ratio corresponds to when there is too little burnable gas available). Accordingly, since all of previous factors exist, Autenrieth et al.'s fuel cell system and method of operating would behave according to the same relationship, wherein a damping factor exists and affects the determination of the quantity needed (Q_{new}).

(For an alternate interpretation, please see * within the 103 rejections.)

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Autenrieth et al.

The teachings of Autenrieth et al. have been previously disclosed and are incorporated herein.

As to claim 2, Autenrieth et al. does not teach that the preset target value of the pause-to-switch-on ratio is less than approximately P/E=10%/90%. However motivation exists for wanting to find an appropriate P/E value. The motivation would be to provide an appropriate amount of fuel via the target P/E value to ensure that the fuel cell would operate without failure (para 0012). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have a target pause-to-switch-on ratio of less than approximately 10%/90% in order to provide the fuel cell with enough fuel for normal operation without providing too much (which would cause a waste in fuel). Accordingly, the pause-to-switch-on ratio is a result effective variable (of having an appropriate amount of fuel for the fuel cell to run without providing too much fuel, which would case a waste in fuel.) Claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result, which is different in kind and not merely in degree from the results of the prior art. (MPEP 2144.08) Discovery of optimum of result effective variable in known process is ordinarily within the skill of art. (In re Boesch, 205 USPQ 215 (CCPA 1980).) Selection of optimum ranges within the prior art's general condition is obvious. (In re Aller, 105 USPQ 233(CCPA 1955)).

9. Claim 5 is rejected under 35 U.S.C. 103(a) as being obvious over Autenrieth et al., as applied to claim 1, in view of US 2003/0031903 (Peschke et al.)

As to claim 5, does not teach that the amount of fuel gas generated or fed to the fuel cell is always smaller than the quantity of fuel that can be converted by the fuel cell.

Peschke et al. teach a fuel cell system with a reformer, similar to that of the instant application (see fig. 1). Additionally, Peschke et al. mention that neither the reformer nor the fuel cell stack operates at 100% conversion (para 0015-0016). Furthermore, it is stated that the anode exhaust may contain 10% or more of un-reacted hydrogen (para 0016). Accordingly, the motivation for generating/feeding fuel gas in a smaller quantity than the quantity that can be converted (theoretically) by the fuel cell is to avoid wasting fuel, as 100% conversion does not take place. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to generate/feed fuel gas in a smaller quantity than the quantity that can be converted (theoretically) by the fuel cell to avoid wasting fuel.

10. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Autenrieth et al., as applied to claim 1 in view of Leboe (US 2004/0080297 A1). *Furthermore, claims 8, 9, and 14 are alternately rejected under 35 U.S.C. 103(a) as being unpatentable over Autenrieth et al., as applied to claims 1, 7, and 11-13, in view of Leboe.

As to claim 6, Autenrieth et al. does not teach the use of a feedback PID controller.

Leboe teaches a method for controlling the operation of a hydrogen generator (which provides fuel for the fuel cell) wherein a PID controller is used based on measured output parameters (para 0020; para 0055). The motivation for using a PID controller system would be to effectively control the fuel cell system (with respect to feed, etc.) Therefore, it would have been obvious to one having ordinary skill in the art

at the time the invention was made to employ the PID controller of Leboe in the fuel cell system of Autenrieth et al. to ensure the fuel cell is operated in a desired and efficient manner. Additionally, one of ordinary skill in the art at the time the invention was made would have provided this specific feedback control to the fuel cell system of Autenrieth et al. with the predictable result of having it operate in the same manner (such that feedback is provided and fuel supply is controlled with respect to it.

*Alternately, as to claims 8, 9, and 14, it can be interpreted that Autenrieth et al. does not specifically mention (a) that the correction factor is the correction factor is the sum of one plus the difference between the preset target value and a current actual value of the pause-to-switch-on ratio (as required by claims 8 and 14) or (b) that the a damping factor between 0.1 and 1, wherein in the case of a first actual value of the pause-to-switch-on ratio, the factor is smaller than in the case of a second actual value of the pause to switch-on ratio, which the second actual value is larger than the first actual value (as required by claim 9).

However, it should be noted that Leboe teaches the use a PID controller to control the fuel supplied to the fuel cell (para 0020; para 0055). (See the rejection of claim 6 and why it would be obvious to combine Leboe with Autenrieth et al., wherein the combination is incorporated herein.) Although the feedback factors are not specifically defined, the determination of such factors with respect to creating a fast response system would be obvious to one of ordinary skill in the art for the purpose of providing appropriate feedback to control the system.

Interpretation 2:

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

11. Claims 1-2, 7-9, and 10-14 are rejected under 35 U.S.C. 103(a) as being unpatentable over US 2002/0057066 A1 (Autenrieth et al.) in view of US 2003/0134166(Skala et al.).

As to claims 1 and 11, Autenrieth et al. teaches a method of operating a fuel cell system that comprises switching the fuel cell on and off electrically depending on the available quantity of fuel (para 0005). By switching the fuel cell on and off via an electric switch the power output to the load is controlled and the fuel flow within or to the fuel cell is controlled (para 0014-0015). Furthermore, it is noted that the fuel cell unit [3] is electrically switched off (pause) if the load requirement for the fuel cell unit requires more fuel than is available and subsequently accumulates fuel until the fuel concentration is high enough so that the fuel cell can provide sufficient electric power, and thus is switched on again (switched on interval) (para 0021). Accordingly, this action is seen as reactive with respect to a generated feedback signal (as if no feedback signal was generated, it would not be known what the load requirement is, and then the actions as listed above would not occur). The aforementioned position with respect to feedback signals is supported by para 0016, which teaches of manipulating the switch

[10] (pause vs. switch-on) with respect to voltage applied to the switch, which is triggered via voltage pulse with regards to the availability of burnable gas. In reaction to this control method, Autenrieth et al. teach that fuel is flowed in such a manner that a sufficient quantity must be reached before the switch [10] to close and operate the fuel (which adjusts the quantity accumulated via the flow of the fuel) (thus adjusting the actual pause/switch-on to the preset target value of pause/switch-on ratio, wherein the preset target value corresponds to the "sufficient burnable gas available" criterion). It is noted that the process (of switching) is repeated periodically (repeatedly), wherein the amount of fuel consumed by the fuel cell would affect power output (as applied to claim 11) (para 0031; para 0033).

Autenrieth et al. only teaches that the quantity of fuel given to a fuel cell changes with respect to a feedback signal such that a pause to switch-on ratio conforms to a preset target value of the pause to switch-on ratio, however they do not teach that the rate at which fuel is supplied to the fuel cell system is adjusted accordingly.

However Skala et al. teaches that a fuel processor controller that varies the hydrogen flow rate in response to changes in a demand for power (para 0033). Doing so as rapidly as possible would cut down on time delays, which would inversely affect the fuel cell performance. Therefore motivation exists for controlling the flow rate of the fuel supply (i.e. providing enough fuel as rapidly as possible in order to prevent time delays in fuel cell function). Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to alter the fuel flow rate of Autenrieth et al.'s system, as taught by Skala et al., in order to provide quick response to improve

efficiency of the fuel cell system. (The combination of Skala et al. with Autenrieth et al. would yield altering the fuel flow (Skala et al.) in response to the pause to switch on ratio (Autenrieth et al.) in order to more quickly reach sufficient available fuel (Autenrieth et al.) as soon as possible. Therefore, a change in the quantity of supplied fuel and a change in the flow rate of the supplied fuel is obvious over one another, as applied to all of the claims. This statement is made in light of the several of inconsistencies and thus 112 antecedent basis issues within the claim language as to "fuel flow" and "quantity of supplied fuel.")

As to claim 2, Autenrieth et al. does not teach that the preset target value of the pause-to-switch-on ratio is less than approximately P/E=10%/90%. However motivation exists for wanting to find an appropriate P/E value. The motivation would be to provide an appropriate amount of fuel via the target P/E value to ensure that the fuel cell would operate without failure (para 0012). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to have a target pause-to-switch-on ratio of less than approximately 10%/90% in order to provide the fuel cell with enough fuel for normal operation without providing too much (which would cause a waste in fuel). Accordingly, the pause-to-switch-on ratio is a result effective variable (of having an appropriate amount of fuel for the fuel cell to run without providing too much fuel, which would case a waste in fuel.) Claimed ranges of a result effective variable, which do not overlap the prior art ranges, are unpatentable unless they produce a new and unexpected result, which is different in kind and not merely in degree from the results of the prior art. (MPEP 2144.08) Discovery of optimum of

result effective variable in known process is ordinarily within the skill of art. (In re Boesch, 205 USPQ 215 (CCPA 1980).) Selection of optimum ranges within the prior art's general condition is obvious. (In re Aller, 105 USPQ 233(CCPA 1955)).

With respect to claim 3, Autenrieth et al. teach the use of a hydrogen gas generating unit (reformer) to supply fuel (hydrogen) to the anode side of the fuel cell (para 0011; para 0029).

With respect to claim 10, Autenrieth et al. teach that their method of operating a fuel cell can be applied to a fuel cell vehicle (para 0027-0028).

As to claim 12, the combination of Autenrieth et al.'s method with Skala et al.'s adjusting of the fuel flow rate would inherently have a closed loop, negative feedback based process wherein the actual value of the open/close ratio and the target value of the open/close ratio conform.

Where applicant claims a composition in terms of a function, property or characteristic and the composition of the prior art is the same as that of the claim but the function is not explicitly disclosed by the reference, the examiner may make a rejection under both 35 U.S.C. 102 and 103, expressed as a 102/103 rejection.

The fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic. In re Rijckaert, 9 F.3d 1531, 1534, 28 USPQ2d 1955, 1957 (Fed. Cir. 1993).

"In relying upon the theory of inherency, the examiner must provide a basis in fact and/or technical reasoning to reasonably support the determination that the

allegedly inherent characteristic necessarily flows from the teachings of the applied prior art." Ex parte Levy, 17 USPQ2d 1461, 1464 (Bd. Pat. App. & Inter. 1990)

In the case of the instant application the basis for expectation of inherency is that method of operating system of Autenrieth et al. is the same the same as that claimed by the instant application. Furthermore, Examiner draws from the specific teachings of Autenrieth et al. As set forth in the rejection to claims 1 and 11, the feedback received (considered "negative feedback" barring specification as to what "negative" pertains to) activates the voltage trigger loop (closed loop) (para 0016). Accordingly, the target open/close ratio (pause to switch-on ratio) corresponds to when sufficient gas exists, whereas the actual ratio corresponds to whether or not sufficient gas exists (as determined by the feedback and loop) (para 0016). Since the actual target value acts according to that of the target value (of being open once sufficient gas availability), it conforms to that of the target value.

As to claims 7 and 13, Autenrieth et al.'s method inherently has the new quantity of supplied fuel determined from a product of a previous quantity of supplied fuel and a correction factor, wherein the correction factor includes at least the target value and the actual values of the pause to switch-on (synonymous to open/close, as listed in claim 12) ratio. The basis for inherency is that the insufficient amount of fuel left (previous quantity) when the switch [10] is opened is still present. Furthermore, fuel is fed until the sufficient amount of fuel is met (thus encompassing both the target and actual values of the pause to switch-on ratio and the claimed correction factor). Therefore, the

new quantity of fuel supplied (before the switch is reconnected) is based on the factors listed above.

As to claims 8 and 14, Autenrieth et al.'s method of operating inherently has a correction factor, wherein the correction factor is the sum of one plus the difference between the preset target value and a current actual value of the pause-to-switch-on ratio. The basis for inherency is that the method of operating is the same between the prior art. Since an old quantity, a target value, and an actual value are encompassed (since fuel is fed until the sufficient amount of fuel is met), it would behave in the same manner (i.e. according to the relationship).

Furthermore, it is noted that the relationship is listed in the instant application $Q_{new} = Q_{old} * F_D * (1 + ((P/E)_{desired} – (P/E)_{actual})$ (para 0034). This relationship supports the position of inherency, as states that this relationship is what exists. With respect to Autenrieth et al., the method operates in such a manner that that a desired ratio and an actual ratio eexist(wherein the desired ratio corresponds to having sufficient burnable gas available and the actual ratio corresponds to when there is too little burnable gas available). Therefore, since all of the factors exist, Autenrieth et al.'s fuel cell system and method of operating would behave following the same relationship.
(For an alternate interpretation, please see ** within the 103 rejections.)

As to claims 9, Autenrieth et al.'s method of operating inherently has a damping factor between 0.1 and 1, wherein in the case of a first actual value of the pause-to-switch-on ratio, the factor is smaller than in the case of a second actual value of the pause to switch-on ratio, which the second actual value is larger than the first actual

value. The basis for inherency is that the method of operating is the same between the prior art. Since an old quantity, a target value, and an actual value are encompassed (since fuel is fed until the sufficient amount of fuel is met), it would behave in the same manner (i.e. according to the relationship).

Furthermore, it is noted that the relationship is listed in the instant application $Q_{new} = Q_{old} * F_D * (1 + ((P/E)_{desired} – (P/E)_{actual})$ (para 0034). This relationship supports the position of inherency, as states that this relationship is what exists. With respect to Autenrieth et al., the method operates in such a manner that that a desired ratio and an actual ratio eexist(wherein the desired ratio corresponds to having sufficient burnable gas available and the actual ratio corresponds to when there is too little burnable gas available). Accordingly, since all of previous factors exist, Autenrieth et al.'s fuel cell system and method of operating would behave according to the same relationship, wherein a damping factor exists and affects the determination of the quantity needed (Q_{new}).

(For an alternate interpretation, please see ** within the 103 rejections.)

12. Claim 5 is rejected under 35 U.S.C. 103(a) as being obvious over Autenrieth et al. in view of Skala et al., as applied to claim 1, in further view of US 2003/0031903 (Peschke et al.)

As to claim 5, does not teach that the amount of fuel gas generated or fed to the fuel cell is always smaller than the quantity of fuel that can be converted by the fuel cell.

Peschke et al. teach a fuel cell system with a reformer, similar to that of the instant application (see fig. 1). Additionally, Peschke et al. mention that neither the

reformer nor the fuel cell stack operates at 100% conversion (para 0015-0016). Furthermore, it is stated that the anode exhaust may contain 10% or more of un-reacted hydrogen (para 0016). Accordingly, the motivation for generating/feeding fuel gas in a smaller quantity than the quantity that can be converted (theoretically) by the fuel cell is to avoid wasting fuel, as 100% conversion does not take place. Therefore it would have been obvious to one of ordinary skill in the art at the time the invention was made to generate/feed fuel gas in a smaller quantity than the quantity that can be converted (theoretically) by the fuel cell to avoid wasting fuel.

13. Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Autenrieth et al. in view of Skala et al., as applied to claim 1, in further view of Leboe (US 2004/0080297 A1). **Furthermore, claims 8, 9, and 14 are alternately rejected under 35 U.S.C. 103(a) as being unpatentable over Autenrieth et al. and Skala et al., as applied to claims 1, 7, and 11-13, in further view of Leboe.

As to claim 6, Autenrieth et al. does not teach the use of a feedback PID controller.

Leboe teaches a method for controlling the operation of a hydrogen generator (which provides fuel for the fuel cell) wherein a PID controller is used based on measured output parameters (para 0020; para 0055). The motivation for using a PID controller system would be to effectively control the fuel cell system (with respect to feed, etc.) Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to employ the PID controller of Leboe in the fuel cell system of Autenrieth et al. to ensure the fuel cell is operated in a desired and efficient

manner. Additionally, one of ordinary skill in the art at the time the invention was made would have provided this specific feedback control to the fuel cell system of Autenrieth et al. with the predictable result of having it operate in the same manner (such that feedback is provided and fuel supply is controlled with respect to it.

**Alternately, as to claims 8, 9, and 14, it can be interpreted that Autenrieth et al. does not specifically mention (a) that the correction factor is the correction factor is the sum of one plus the difference between the preset target value and a current actual value of the pause-to-switch-on ratio (as required by claims 8 and 14) or (b) that the a damping factor between 0.1 and 1, wherein in the case of a first actual value of the pause-to-switch-on ratio, the factor is smaller than in the case of a second actual value of the pause to switch-on ratio, which the second actual value is larger than the first actual value (as required by claim 9).

However, it should be noted that Leboe teaches the use a PID controller to control the fuel supplied to the fuel cell (para 0020; para 0055). (See the rejection of claim 6 and why it would be obvious to combine Leboe with Autenrieth et al., wherein the combination is incorporated herein.) Although the feedback factors are not specifically defined, the determination of such factors with respect to creating a fast response system would be obvious to one of ordinary skill in the art for the purpose of providing appropriate feedback to control the system.

Response to Arguments

14. Applicant's arguments filed March 27, 2008 have been fully considered but they are either not persuasive or moot. in view of the new ground(s) of rejection.

It should be noted that the arguments with respect to the changing of the rate of *fuel flow* are moot with respect to the claim interpretation taken in Interpretation 1, as new matter issues with respect to this amendment exist and thus it is taken that quantity control is what is being provided. In this interpretation, the arguments are not persuasive, as the claim language is claiming something that cannot be claimed and thus is not read into the claim language

Applicant argues that Autenrieth et al. does not teach of controlling, regulating, or adjusting the rate at which fuel is provided to the fuel cell based on the on/off or "pause-to-switch-on ratio of the electric connection," such that the latter is regulated to a preset value, since Autenrieth et al. merely provides fuel continually.

Examiner respectfully disagrees. Skala et al., as used in Interpretation 2, has been provided as a secondary piece show how adjusting a rate of fuel provided would be obvious to one of ordinary skill in the. The combination of Skala et al. with Autenrieth et al. would yield the argument moot.

Applicant mentions a portion in the instant application (para 0026-0031 and fig. 3), which shows that the quantity (Q) is metered over time (T), corresponds to an increased rate at which fuel is provided to Q, which is not provided by Autenrieth et al.

In response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., the manner in which quantity is metered over time) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from

the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Furthermore, Examiner would like to state that a change in quantity over a specific time period is not necessarily indicative that the rate is being changed (as is the basis for the 112, new matter rejection). If the flow rate remains the same, quantity of fuel still builds up over a period of time. However, if it can be shown that support exists for adjusting a fuel flow rate, then Skala et al. has been added as a secondary piece as to why it would have been obvious to one of ordinary skill in the art to adjust a fuel flow rate with respect to demand, and thus when combined with the pause/switch-on method of Autenrieth et al. obviates the claimed invention.

Applicant agues that Autenrieth et al., operates a switch but does not suggest regulating the rate at which fuel is supplied to the fuel cell system as a function of the pause-to-switch ratio.

Examiner submits that Autenrieth et al. combined with Skala et al. (via Interpretation 2) obviates the claimed invention. (Please see the rejection for claims 1 and 11 above.)

Applicant comments on a statement made in the Advisory Action (dated 11/06/07), wherein Examiner comments that control for a fuel flow delivered exists, since Autenrieth et al. mentions an opening and closing of a switch (ratio) based on the sufficient burnable gas available criterion. Applicant's argues that the interpretation taken that during an "off" portion, the fuel is not flowing is incorrect since para 0021, 0022, and 0029 indicate that fuel is being continually supplied.

First, Examiner would like to note that in response to applicant's argument that the references fail to show certain features of applicant's invention, it is noted that the features upon which applicant relies (i.e., the fact that in an off portion that there is no fuel flowing) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

It is also noted that that the limitation (as previously existed) is not within the claim language anymore, wherein the limitation that the fuel flow is controlled. Additionally, Skala et al. is relied upon teaching the change of the flow rate of the fuel (as currently claimed).

Examiner submits that Applicant's arguments are persuasive in the fact that the fuel is still flowing in an "off." However, Examiner would like to clarify the record that the prior art would have applied to the previously presented limitation.

Within the amendment after final (submitted 10/29/07), Applicant had argued that claim 11 recites "controlling a flow of fuel to said fuel cell system," wherein that feature is not present in Autenrieth et al.

Examiner respectfully disagrees with the statement above. It is stated that in the switched off state that fuel is still delivered. However, fuel is not being consumed, therefore the flow of fuel is different, and thus controlled in such a manner (para 0021). Additionally, it is stated that some of the hydrogen (fuel) is recycled, thus changing the flow (as the amount recycled would be different during consumption and non consumption times) (para 0022). Additionally, it is stated that some of the fuel is stored

in the intermediate storage device, again affecting flow. Since all of the aforementioned affect flow, they do control flow in some manner.

With respect to the arguments regarding the 103 rejections, Applicant argues that the prior art used to obviate the rejected claims (Leboe) do not cure the deficiencies of the primary reference (Autenrieth et al.). Applicant does not argue how the combination is not proper. Therefore, the Examiner maintains the obviousness rejections and upholds the rejection of the primary reference, as above. (It is noted that Meritt et al. and Higashiyama et al. have been removed as secondary pieces at this point and thus arguments with respect to them are moot.)

Conclusion

15. Note: Although some of the previous prior art rejections have been removed, as they served as duplicate rejections. For simplicity's sake, Examiner has removed the extraneous rejections for simplicity's sake. However, this is not an admission that the art is no longer applicable, and it may be applied at a later time.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to EUGENIA WANG whose telephone number is (571)272-4942. The examiner can normally be reached on 7 - 4:30 Mon. - Thurs., EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

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/E. W./
Examiner, Art Unit 1795

/Gregg Cantelmo/
for E. Wang, Examiner of Art Unit 1795